

Study of Linear Generator for Vibration Energy Harvesting of Frequency more than 50Hz

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Abstract : Energy harvesting is the technology which gathers and converts external energies such as light, vibration and heat which are disposed into reusable electrical energy and uses such electrical energy. The vibration energy harvesting is very interesting technology because it produces very high density of energy and unaffected by the climate. Vibration energy can be harvested by the electrostatic, electromagnetic and piezoelectric systems. The electrostatic system has low energy conversion efficiency, and the piezoelectric system is expensive and needs the frequent maintenance because it is made of piezoelectric ceramic. On the other hand, the electromagnetic system has a long life time and high harvesting efficiency, and it is relatively cheap. The electromagnetic harvesting system includes the linear generator and the rotary-type generator. The rotary-type generators require the additional mechanical conversion device if it uses linear motion of vibration. But, the linear generator uses directly linear motion of vibration without a mechanical conversion device, and it has uncomplicated structure and light weight compared with the rotary-type generator. Therefore, the linear electromagnetic generator can be useful in using vibration energy harvesting. The pole transformer systems need electricity sensor system for sending voltage and power information to administrator. Therefore, the battery is essential, and its regular maintenance of replacement is required. In case of the transformer of high location in mountainous areas, the person can't easily access it resulting in high maintenance cost. To overcome these problems, we designed and developed the linear electromagnetic generator which can replace battery in electricity sensor system for sending voltage and power information of the pole transformer. And, it uses vibration energy of frequency more than 50 Hz by the pole transformer. In order to analyze the electromagnetic characteristics of small linear electric generator, a commercial electromagnetic finite element analysis program "MAXWELL" was used. Then, through the actual production and experiment of linear generator, we confirmed output power of linear generator.

Keywords : energy harvesting, frequency, linear generator, experiment

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